

ASSIGNMENT – 1 (Due: 16 August 2017)

1. This program is to make you appreciate the notion of tractability of problems:

Write 5 simple programs that take (i) linear, (ii) $\Theta(n \log n)$, (iii) quadratic, (iv) cubic and (v) exponential time complexities. Record the time taken by each of these programs on an input of size of 1,000,000.

Submit a (hand-written) document in which the time taken by the 5 algorithms are given in a table along with your observations and analysis.

2. This program is to make you appreciate the notion of correctness of an algorithm:

Write an algorithm for quick sort and implement it.

Check for correctness of the Partition (A, p, r) procedure using the three test criteria :

Partition (A, p, r)

x ← A[p]

..

..

return j

(i) The two pointer indices i and j never reference an element of A outside the interval [p .. r]

(ii) The index j is not equal to r when Partition terminates.

(iii) (the loop invariant) Every element of A[p..j] is less than or equal to every element of A[j+1..r] when Partition terminates.

Submit your program in which these test criteria are embedded and when run give the sorted list of numbers along with the results for the test criteria.